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ABSTRACT

The distribution of course start times throughout the day at Arizona State University was analyzed to improve classroom utilization at a large urban university. Departments responsible for peak period utilization were also identified, and students were surveyed to determine interest in taking courses outside the peak period. It was found that academic departments were independently scheduling a disproportionately large number of course sections in a relatively small span of morning time periods. One reason given by departments for morning scheduling was student preference. A total of 400 students were questioned about whether they preferred courses in the morning, afternoon, or evening, and why. Subsequent analysis of department course offerings scheduled during these peak hours identified key departments able to adjust their scheduling time without disrupting course availability. In the first year after the peak hours report was presented to the academic deans, a significant decrease in peak period class scheduling occurred. Departments successfully reduced by 6.7% the actual number of courses scheduled during the peak usage periods. (SW)

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Classroom Utilization:

Placing Departments on a Scheduling Diet

by

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Ann K. Dickey, Chair
Forum Publications Editorial
Advisory Committee

Classroom Utilization:

Placing Departments on a Scheduling Diet

Abstract

This paper describes a study designed to improve classroom utilization at a large urban university through the analysis of the distribution of course start times throughout the day. The study found that academic departments were independently scheduling a disproportionately large number of course sections in a relatively small span of morning time periods. The subsequent analysis of department course offerings scheduled during these "peak hours" identified key departments able to adjust their scheduling time without disrupting course availability. In the first year after the "peak hours" report was presented to the academic deans, a significant improvement (decrease) in peak period class scheduling occurred.

CLASSROOM UTILIZATION:

PLACING DEPARTMENTS ON A SCHEDULING DIET

Introduction

Doing more with less! This phrase has become an underlying theme in hundreds of institutional research offices throughout the country. To many, "less" refers to declining enrollments, or too few faculty, or too little budget. This report looks at the case of inadequate facilities and the actions that an institution can set in place when the problem is, "Too many students and too little space." The paper describes an effort to improve classroom usage in an urban institution with a documented space shortage and continued enrollment growth.

The importance of this analysis to our institution was an increase in classroom utilization. The importance of the analysis to the institutional researcher is the process we followed for improving utilization.

An important observation surfaced with this project. Research on the subject of space utilization is sparse. There are few theoretical models or sophisticated statistical analyses in the literature. In particular, classroom scheduling evolves from the operational side of the institution. Scheduling processes are the foundation of any institution, and occur within each academic unit. Recommending changes to course starting times therefore, is not a "top down" management process, but one of participative management with academic departments. Communication between the administrative researcher and the academic units cannot be emphasized enough when studying classroom scheduling.

Statement of the Problem

Arizona State University is a growing urban university supporting the metropolitan area of Phoenix, ninth largest city in the country, and fastest growing of the ten largest cities. Enrollment growth in the 70's and 80's placed the university sixth in size among the nation's campuses. This growth, occurring at a time of moderate state support, has resulted in facilities deficiencies within the campus.

To document this deficiency, a facilities survey was conducted with eighteen established peer institutions participating. Survey results indicated that deficiencies existed in all standard space types. While ASU's space types, such as office and class laboratory space, were 20 to 30 percent below the peer group average, ASU's classroom space was found to be only 2 percent below the mean. Therefore, if efficiencies in classroom utilization were achieved, the resulting surplus classroom space could be reassigned to other uses.

Strategies for Improving Classroom Utilization through Scheduling

Classroom utilization is usually measured by two distinct factors. One factor is room usage, or the number of hours a classroom is scheduled for use during the week. The second is station (or seat) utilization, or the percentage of filled stations when the room is in use.

Strategies to improve room usage attempt to maximize the hours each room is scheduled by scheduling during the noon hour, in the evening, and on the weekend. However, analysis of the distribution of courses by time of day and day of week can also be informative. By monitoring room usage statistics, departments can be made aware of high and low utilization time

periods, and use this information to improve course scheduling. Less obvious strategies include reducing the break time between courses. For example, Blakesley found that an increase of five minutes in the course break period resulted in a loss of 200 minutes of class time weekly.

Each of the above strategies should, to some extent, be present in every classroom scheduling system. Each strategy should be reviewed periodically through the analysis of available data.

Distributing course start times evenly throughout the day was of particular interest to ASU because of information indicating a disproportionate number of courses offered between 8:40 and 12:30 on Monday-Wednesday-Friday and 9:15 to 11:50 on Tuesday-Thursday. The goal of this strategy was to reschedule course sections away from these peak start times into low utilization time periods. Once the rescheduling was accomplished, fewer actual rooms would be in use, and surplus classrooms could be remodeled to relieve the shortages in other space types. However, this had to be done without lower student enrollment.

Analysis

The first part of our analysis focused on documenting when peak period utilization occurred during the day and which departments were responsible for the peak. The second part focused on determining whether students were interested in taking courses outside the peak period and identifying strategies to manage the enrollment patterns of students.

Identifying Periods of Peak Classroom Usage

Basically, the university teaches classes within two sequences during the week: 1) Monday, Wednesday, and Friday (50 minute class periods), or 2) Tuesday and Thursday (1 hour and 15 minute class periods). Figures 1 and 2

Figure 1

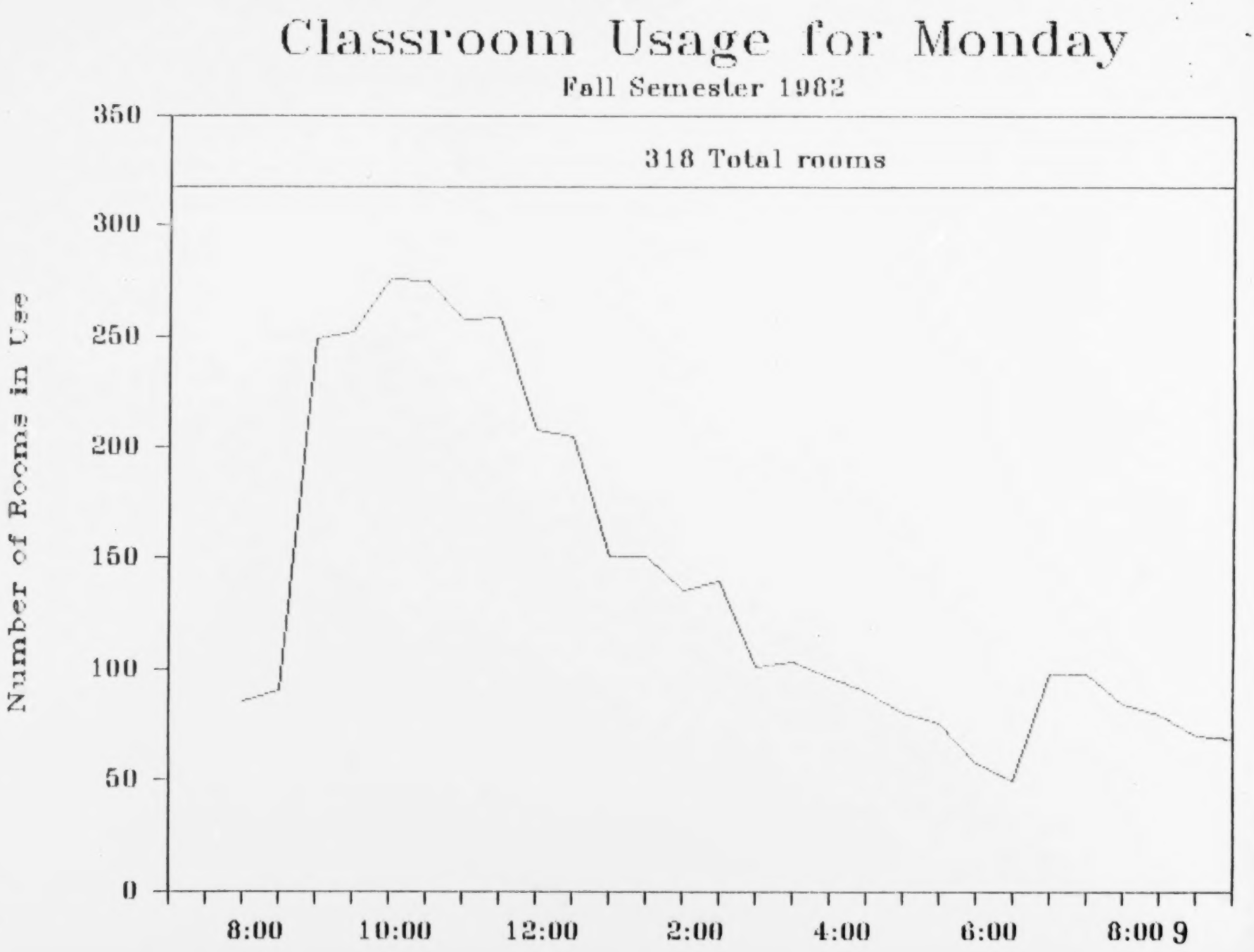
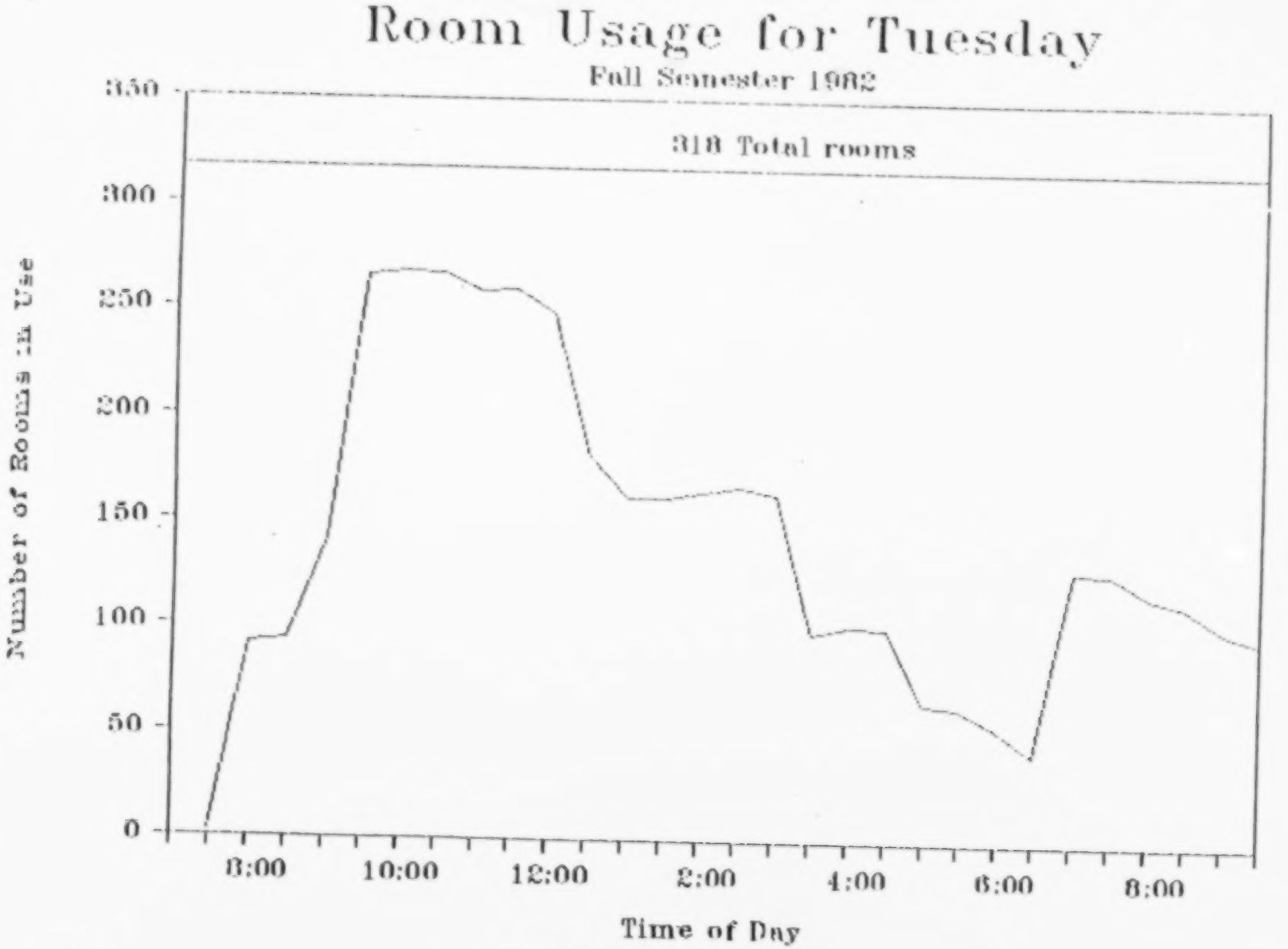

Classroom Usage for Monday
Fall Semester 1982
318 Total rooms
Number of Rooms in Use
350
300
250
200
150
100
50
0
8:00
10:00
12:00
2:00
4:00
6:00
8:00

Figure 2


Room Usage for Tuesday
Fall Semester 1982
318 Total rooms
Number of Rooms in Use
350
300
250
200
150
100
50
0
8:00
10:00
12:00
2:00
4:00
6:00
8:00
Time of Day

present the distribution of classroom use during the day on Monday and Tuesday, respectively. It was apparent that for the "Monday-Wednesday-Friday" sequence, the university needed to shift classes outside the 8:40 a.m. to 12:30 p.m. time period. In the "Tuesday-Thursday" sequence, courses needed to be reduced in the 9:15 a.m. to 11:50 p.m. period.

Identifying Departments Loading the Peak Hours

The next task was to identify those departments scheduling a high percent of their daily offerings during the identified peak hours. Table 1 was developed as a management tool to identify departments loading the peak. For example, on the Monday-Wednesday-Friday sequence, 30 percent of the entire university load came from two departments -- Foreign Languages and English. Further, in both cases, more than 60 percent of all the offerings in these departments on Monday-Wednesday-Friday were scheduled during the peak (80 percent for Foreign Languages)!

The decision of the university was to require all departments to reduce their peak period scheduling by 10 percent, unless the unique circumstances of the clientele served or room required that the course be offered during the peak. It was clear that if significant gains were to be made in freeing space for other uses, they would only come if the Departments of English and Foreign Languages scheduled more classes outside the peak.

The scheduling pattern on Tuesday-Thursday was not as dramatic as the Monday-Wednesday-Friday sequence in terms of the number of departments contributing to the peak. However, the English department's peak load on this sequence was far greater than any other department.

Table 1

MORNING CLASSROOM USE HOURS*
AS A PERCENT OF DAILY CLASSROOM USE HOURS**
MON - WED - FRI FALL 1983

80% AND ABOVE	MORNING USE HOURS	60 TO 79%	MORNING USE HOURS	40 TO 59%	MORNING USE HOURS	LESS THAN 40%	MORNING USE HOURS
FORN LANG	343	ENGLISH	393	MATH	168	MUSIC	72
PHILOSOPHY	37	ACCOUNTING	87	MANAGEMENT	60	SPECIAL ED	9
ANTHROPOLOGY	27	HISTORY	80	SCH OF ENGR	49	NURSING	6
GEOGRAPHY	18	MARKETING	57	FINANCE	45	COMP SCI	3
LEISURE STUDIES	15	POLI SCI	57	CHEMISTRY	44	IND/MGMT ENG	2
INTERDISC HUM	14	PHYSICS	54	ECONOMICS	39	ANAL & SYS	0
SECONDARY ED	14	COMMUNICA	54	ELEM EDUC	30	DANCE	0
RELIGIOUS STD	12	THEATRE	52	HEALTH & PE	30	MANU ENGR	0
ZOOLOGY	9	ADMIN SERV	48	QUANT SYS	27	AEROSP STD	0
JOURN/TELE	7	ELEC & COMP	45	PRE-PROF ARC	18	HI/ADULT ED	0
SOC/VAL/TECH	5	MECH & AERO	45	AERO TECH	15	ED ADM & SUP	0
		PSYCHOLOGY	39	DESIGN SCI	15	HEALTH SERV	0
		HOME ECON	36	LAW	15	WOMENS STD	0
		ART	33	GEOLOGY	12	MIL SCIENCE	0
		AGRICULTURE	27	EDUC TECH	12	PUB AFFAIRS	0
		CHEM & BIO	27	CONSTRUCTION	12		
		GRAPH/IND EN	21	SOCIAL WORK	8		
		SOCIOLOGY	21	IND TECH	6		
		CRIM JUSTICE	21	EDUC PSYCH	6		
		CIVIL ENGR	20	PLANNING	3		
		SPEECH/HEAR	18				
		ARCHITECTURE	18				
		COUNSELOR ED	12				
		BOTANY/MICRO	11				
		INTERDISC	9				

*ONE USE HOUR EQUALS 50 MINUTES OF SCHEDULED CLASSROOM USE

**USE HOURS INCLUDES COURSES SCHEDULED FROM 7:40 THROUGH 5:30
MORNING USE HOURS ARE 8:40 THROUGH 12:30
ALL DISSERTATION, SPECIAL TOPICS, AND HONORS SECTION EXCLUDED
ONLY COURSES SCHEDULED IN 31-70 SEAT CLASSROOMS INCLUDED

Student Preferences

One of the reasons given by departments for scheduling classes in the morning was student preference. Departments did not want to offer classes during periods when enrollments were slack. Most departments felt they had a "feel" for when students wanted to take different courses; however, there was no hard information to support this conclusion.

To develop basic information on student scheduling preference, 500 students were randomly selected from the student body (about 1.25 percent). Four hundred of these were contacted by telephone and poled as to whether they preferred courses in the morning, afternoon, or evening, and why. Exhibit 1 presents the results of this survey.

The results showed that the majority of the students have a life style set around attending classes in the morning. For example, 74 percent of the students poled preferred morning classes, although only 23 percent of those preferred morning classes due to work. Over 50 percent preferred morning classes to free the afternoon for other activities, such as study or recreation. However, the university was surprised to find that 20 percent of the students sampled preferred classes in the afternoon or evening and an additional 6 percent were not opposed to afternoon classes. Further, 78 percent of the students sampled attended an afternoon or evening class at least one day a week and 41 percent attended an afternoon or evening class on three or more days.

From this information, we concluded that there was a group of students that would support total class scheduling in the afternoon or evening, and a larger group willing to take one or two classes other than in the the morning on a regular basis. In other words, departments could shift enough

courses outside the peak to make a difference without risking significant losses in enrollments.

Managing Student Demand for Courses

There are courses which can be scheduled without jeopardizing enrollment, such as courses required for degree completion. For example, the first two semesters of English are required by all majors. If all sections of these courses were offered outside the peak period, the enrollment would follow the course and shift to the new schedule without loss in course demand.

It was decided that a total "lock-out" of these courses was not in the best interests of the university. However, this strategy was reserved as a possible future course of action, should the university not voluntarily see improvements in the scheduling patterns of departments.

Results

Analysis of 1984 and 1985 fall semester course scheduling patterns found that academic departments successfully reduced by 6.7 percent the actual number of courses scheduled during the peak usage periods. Considering that an increase in total courses taught occurred between 1984 and 1985, departments achieved a reduction of 10.3 percent in the ratio of peak period courses to total courses scheduled. Of the 70 academic departments in the university, 41 (or 59 percent) were able to decrease the ratio of peak hours to total hours offered. Twenty-four departments achieved a peak hour-to-total hour reduction of 20 percent or more between 1984 and 1985.

The peak periods represent approximately 12 hours during a 50 hour daytime week which begins at 7:40 a.m. and ends at 5:30 p.m. Ideal utilization suggests that 2 percent of the weekly course load occur during any hour, or 24 percent of the course load during the defined 12 hour peak periods. Incorporating evening hours would lower this "ideal" percentage. While the 24 percent "ideal" peak period utilization is not a realistic goal, the reduction in the 1985 overall usage level to 39 percent (down from 44 percent) was viewed as a success.

Conclusion

The findings of this study lead to three basic conclusions. First, classroom utilization can be improved from any of a wide variety of strategies, many of which require little or no resources in the form of capital construction funds.

Second, we found it important to draw sufficient data to reflect the true environment of the institution before initiating course scheduling changes. Our initial peer space survey isolated classroom space as the space type with the potential for surplus space. The student survey established a demand for afternoon classes, contrary to the general belief of the faculty. The peak demand analysis by department confirmed that only a few key departments required reduction in peak hour usage.

Finally, the communication between the researcher and the academic units is a critical aspect for success in classroom utilization. Classroom scheduling in an academic department, and across departments is a highly interrelated system of requirements and constraints. The start time of each course is often positioned by the academic unit in a way which allows students to matriculate in an efficient and orderly manner. Changes to

these start times to improve overall utilization may result in roadblocks to certain student groups, thus delaying degree completion. To achieve improved utilization, the departments must adjust their course offerings in a way that prevents these roadblocks, while the institutional researcher provides analysis and feedback to direct further scheduling adjustments.

EXHIBIT 1

ARIZONA STATE
UNIVERSITY TEMPE, ARIZONA 85287

Management and Financial Analysis (602) 965-2318

M E M O R A N D U M
March 8, 1984

TO: AAAC

FROM: Class Scheduling Subcommittee

SUBJECT: Student Responses to Survey

SURVEY

The following summarizes the responses to the telephone survey concerning student class schedule preferences conducted by Bruce Merrill. Bruce was willing to do this as a favor for us, including the scheduling questions with a survey he was doing for ASASU. These questions are not as detailed as we would like, but give some indication of the class scheduling preferences of our students.

The sample was a random sample of 500 students from the student body. Approximately 400 students responded to this survey.

QUESTIONS AND RESPONSES

How many days of the week do you have classes after 1:00 P.M.?

None	22%
1 Day	13%
2 Days	24%
3 Days	19%
4 Days	8%
5 Days	14%

Do you prefer morning, afternoon, or evening classes?

Morning	74%
Afternoon	18%
Evening	2%
No Preference	6%

If you prefer morning classes, why do you like classes scheduled at this time?

Rather get classes over with	25%
Do other things in afternoons/study/play	25%
Work in afternoons	23%
More energy in the morning	11%
Like getting up early	4%
Spend time with children in afternoons	3%
Work at night	2%
More parking available	2%
Classes are offered then	2%
Public transportation is better then	1%
Get out of afternoon heat	1%
Most campus activities are in the morning	1%

If you prefer morning classes, why do you dislike afternoon or evening classes?

Use afternoons for other things/study/play	30%
Work in afternoons	22%
Have less energy in afternoons	15%
Spoils the day/breaks up the day	8%
Too hot	6%
Rather get classes over with	6%
Morning person	3%
Conflicts with children's activities	3%
No parking/traffic bad	4%
Classes offered mornings	2%
Buses stop running early	1%

If you prefer afternoon or evening classes, why do you like classes scheduled at this time?

Sleep in later	27%
Work full time	26%
Work at night	8%
Classes offered in afternoons	8%
Family/Children	8%
Work mornings	6%
Evening person	6%
Parking better	4%
Concentrate better then	3%
Study in mornings	4%

If you prefer afternoon or evening classes, why do you dislike morning classes?

Work during mornings	32%
Dislike getting up early	32%
Traffic/parking problems	10%
Can't find child care/family reason	8%
Classes not offered	5%
Work nights	5%
Less energy then/more awake afternoons	5%
No peer pressure in afternoons	2%
Crowded classes in mornings	1%

JDP/si-60